



PATENT
BH&L Case 8627/405

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Kieran P. J. Murphy : Cook Case PA-5281
Serial No.: 09/594,685 :
Filed: June 16, 2000 : Group Art Unit: 3732
For: METHOD AND APPARATUS : Examiner: Eduardo C. Robert
FOR STRENGTHENING :
VERTEBRAL BODIES :

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DECLARATION UNDER 37 CFR 1.132

KIERAN P. J. MURPHY declares as follows:

1. I am the sole inventor of this Application. I am a medical doctor, graduated from The Royal College of Surgeons in Ireland, Dublin, Ireland. I am licensed to practice medicine in Maryland, license No. D0054096, and was previously licensed to practice medicine in Michigan and New York. I am a practicing surgeon, and I typically perform dozens of surgical procedures in a week. I have performed over 500 vertebroplasty injection surgeries.

2. I have been a professional Lecturer in Neuroradiology in the Department of Radiology of the Veterans Administration Center in Ann Arbor, Michigan; Lecturer in Neuroradiology in the Department of Radiology of The University of Michigan in Ann Arbor, Michigan; Assistant Professor of Radiology, Section Chief of Neuroradiology, Director of Interventional & Therapeutic Neuroradiology, and Director of Radiology Research in Albany Medical College, Albany, New York; Assistant Professor of Radiology and Neurological Surgery and Director of Interventional Neuroradiology in the Division of Neuroradiology of Johns Hopkins University, School of Medicine, Baltimore, Maryland. I am presently Associate Professor of Radiology and Neurological Surgery and Director of Interventional Neuroradiology at Johns Hopkins University, School of Medicine. I have authored or co-authored 77 peer-reviewed articles, 11 review articles, and three published letters for professional medical journals. I have authored three chapters of published books. I am named as sole or joint inventor in a number of patents and pending patent applications, including the following:

- a. Murphy U.S. Patent 6,273,916, *Method and Apparatus for Strengthening Vertebral Bodies*, issued August 14, 2001;
 - b. Murphy U.S. Patent 6,450,973, *Biopsy Gun*, issued September 17, 2002;
 - c. Murphy U.S. Patent 6,488,677, *Needle Control Device*, issued December 3, 2002;
 - d. Cowan et al. U.S. Patent 6,585,677, *Shunt*, issued July 1, 2003;
 - e. Murphy U.S. Patent 6,749,595, *Cement Delivery Needle*, issued June 15, 2004;
 - f. Murphy et al. U.S. Patent 6,752,791, *Needle Control Device*, issued June 22, 2004;
 - g. Murphy et al. U.S. Patent Application Publication US 2003/0181807, *Method, Device and System for Implanting a Shunt*, published September 25, 2003;
 - h. Murphy U.S. Patent Application Publication US 2003/0204248, *Device Viewable under an Imaging Beam*, published October 30, 2003;
 - i. Anderson et al. U.S. Patent Application Publication US 2004/0009459, *Simulation System for Medical Procedures*, published January 15, 2004;
 - j. Cowan et al. U.S. Patent Application Publication US 2004/0030278, *Shunt*, published February 12, 2004; and
 - k. Murphy et al. U.S. Patent Application Publication US 2004/0070253, *Surgical Chair for Percutanaceous Spinal Catheter Insertion*, published April 15, 2004.
3. Recent articles co-authored by me include the following:
- a. Alan Hammond, Lee H. Riley III, Philippe Gailloud, David A. Nussbaum, Monica Watkins, and Kieran J. Murphy, "Treatment Considerations for Vertebroplasty in Men," *AJNR Am J Neuroradiol* 25:639-641, April 2004.
 - b. Doris D. M. Lin, MD, PhD, Philippe Gailloud, MD, and Kieran J. Murphy, MD, FRCPC, "Percutaneous Vertebroplasty in Benign and Malignant Disease," *Neurosurgery Quarterly*, 11(4):290-301, 2001.
 - c. Kieran J. Murphy, MD, FRCPC, and Doris D. M. Lin, MD, PhD, "Vertebroplasty: A Simple Solution to a Difficult Problem," *Journal of Clinical Densitometry*, 4(3): 189-197, Fall 2001.
 - d. David A. Nussbaum, MS, Philippe Gailloud, MD, and Kieran Murphy, MD, "The Chemistry of Acrylic Bone Cements and Implications for Clinical Use in Image-guided Therapy," *J Vasc Interv Radiol* 15:121-26, February 2004.

e. Cristiana Vasconcelos, Philippe Gailloud, Norman J. Beauchamp, Donald V. Heck, and Kieran J. Murphy, "Is Percutaneous Vertebroplasty without Pretreatment Venography Safe? Evaluation of 205 Consecutive Procedures," *AJNR Am J Neuroradiol*, 23:913-917, June/July 2002.

4. A copy of my *curriculum vitae* is attached to this Declaration.

5. I have been requested to give the expert opinions expressed below in this Declaration. I believe I am qualified, by education and experience, to do so.

6. I have been advised that Claims 1-21 of my pending patent application Serial No. 09/594,685, filed June 16, 2000, for METHOD AND APPARATUS FOR STRENGTHENING VERTEBRAL BODIES, have been rejected in an Office Action dated March 24, 2004, hereinafter the "Office Action". I am advised that in one element of this rejection, the Examiner rejects my Claims 17-19 as anticipated by Lazarus, U.S. Patent 4,128,173. I understand that for the Lazarus patent to anticipate my claims, every element recited in these claims must be present in the Lazarus patent. I am of the opinion that Lazarus does not show *vertebroplasty injection components* which I recite in Claim 17, lines 3 and 5.

7. The Examiner comments at page 5 of the Office Action, that Lazarus's tray 10b includes a syringe (item 36 in his drawings) and needle (item 38); and the Examiner alleges that Lazarus's syringe and needle are capable of being used in a spinal surgical procedure, *e.g.*, for injecting anesthesia [*i.e.*, an anesthetic]. I understand that terms in a patent or patent application, such as "vertebroplasty injection components", are given the ordinary meaning of those terms to *persons of ordinary skill in the art*, such as a surgeon performing a vertebroplasty injection. I am of the opinion that Lazarus' syringe and needle are **NOT** *vertebroplasty injection components*. While it is true that Lazarus's syringe and needle are capable of injecting anesthetic, including doing so into the spine, injecting anesthetic into the spine is not vertebroplasty injection, and a syringe and needle for injecting anesthetic are not vertebroplasty injection components, but rather general surgical apparatus.

8. Lazarus's needles are thin-walled and not suitable for vertebroplasty injection. A bone-cement injection needle suitable for vertebroplasty injection is much more robust (typically eleven gauge or thirteen gauge, see my Application at page 6, lines 3-6, although sometimes a 14

gauge needle would be used) than the needles described by Lazarus (26 gauge, see Lazarus at column 1, lines 37-39). Bone-cement injection needles are used as agents of delivery of bone cement, and they must be sturdy enough to do the job.¹

9. The Examiner alleges further that “Lazarus’s tray 10a includes a cannula for injecting or aspirating fluid and it is capable of being used in a spinal surgical procedure, e.g. for injecting or aspirating nucleus pulposus [sic].” (Office Action at page 5.) This comment appears to be based on Lazarus at Figure 1 and column 3, lines 6-8, “FIG. 1 illustrates a package 10 containing ... an elongated cannula 16.” Lazarus’s cannula 16 is smaller than one millimeter, see Lazarus at column 3, lines 54-57 (1 millimeter incision is slightly longer than the diameter of cannula 16) and column 4, lines 52-55 (Becton-Dickinson 18G23/4 thin wall catheter is preferred). In my opinion, in making the statement just quoted, the Examiner is mistaken on two counts. First, Lazarus’s preferred Becton-Dickinson 18G23/4 thin wall catheter cannula 16 would be too small for injecting or aspirating nucleus pulposus (the central portion of intervertebral disks, consisting of a pulpy elastic substance, to which the Examiner apparently intended to make reference). Secondly, while injecting or aspirating nucleus pulposus may be a spinal surgical procedure, it is not vertebroplasty injection, and a cannula for injecting or aspirating nucleus pulposus is not a vertebroplasty injection component.

10. The Examiner alleges further that “each [Lazarus] tray include[s] a[n] injection component and they can perform a function in spinal surgery if one so desires.” (Office Action at page 5.) In my opinion, in making the statement just quoted, the Examiner is mistaken on two counts. First, the Lazarus components are not suitable for performing spinal surgery. Secondly, a spinal surgical procedure is not necessarily a vertebroplasty injection, and components for performing spinal surgery are not necessarily vertebroplasty injection components.

¹ Medical needles’ diameters are usually referred to by Gauge numbers according to the Stub’s Needle Gauge System, according to which a Gauge 11 needle has an outside diameter of 0.1190 to 0.1210 inches, a Gauge 13 needle has an outside diameter of 0.0940 to 0.0960 inches, a Gauge 14 needle has an outside diameter of 0.0820 to 0.0840 inches, and a Gauge 26 needle has an outside diameter of 0.0180 to 0.0185 inches. Inside diameters depend on wall thicknesses, and can range from about 0.0920 to about 0.1060 inches for Gauge 11, from about 0.0690 to about 0.0830 inches for Gauge 13, from about 0.0610 to about 0.0730 inches for Gauge 14, and from about 0.0095 to about 0.0110 inches for Gauge 26.

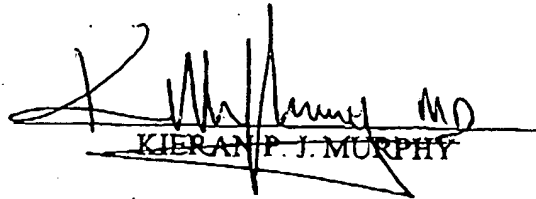
11. The Examiner alleges further that “the Lazarus kit has the ability to perform the functional language of the claim.” (Office Action at page 5.) In my opinion, in making the statement just quoted, the Examiner is mistaken. My Claim 17 recites “performing a first vertebroplasty injection through a first pedicle of a vertebral body;” and “performing a second vertebroplasty injection through a second pedicle of said vertebral body”. In my opinion, the Lazarus kit does **NOT** have the ability to perform a first vertebroplasty injection through a first pedicle of a vertebral body; or to perform a second vertebroplasty injection through a second pedicle of the vertebral body.

12. The Examiner asserts, incorrectly in my opinion, that a surgeon would use the peritoneal fluid treatment components disclosed by Lazarus in performing a vertebroplasty injection. In my opinion, the syringe, needle and cannula that Lazarus discloses are not “vertebroplasty injection components”, but rather general surgical or peritoneal fluid treatment components. In my opinion, just because a surgeon would use some type of syringe, needle and cannula in vertebroplasty injection, does not mean that he or she would use the peritoneal fluid treatment components disclosed by Lazarus in performing a vertebroplasty injection.

13. I am advised that in one element of the March 24, 2004, rejection of the claims of my Application, the Examiner rejects my Claims 1-16, 20 and 21 as unpatentable over (obvious in view of) Vagley U.S. Patent 6,158,437; or as obvious from Vagley in view of 11 other references (Office Action, pages 4-5). I understand that for the Vagley patent to render my claims obvious, the Examiner must show each element of the claimed combination, as well as a teaching or suggestion to make the claimed combination.

14. I have reviewed the Vagley Patent. Vagley describes a rhinoplasty kit for for plastic surgery (nose jobs). None of Vagley’s components can be used for vertebroplasty. There is no vertebroplasty needle. There is no mixing bowl or spatula or bone cement. The Vagley Patent is directed to a tray of rhinoplasty components and their arrangement in order of use during rhinoplasty. Vertebroplasty is a different procedure, and it uses different components. In my opinion, neither the Vagley Patent alone, nor the Vagley Patent in combination with the 11 other references upon which the Examiner relies, would suggest to a person of ordinary skill in the art, the combinations claimed in my Claims 1-16, 20 and 21.

15. I further declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and I am warned that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. 1001) and may jeopardize the validity of the application or any patent issuing thereon.



KIERAN P. J. MURPHY

Date signed: July 26, 2004

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The Johns Hopkins University School of Medicine

Kieran P.J. Murphy, MB. BCH., FRCPC

04/27/04
Date Revised

DEMOGRAPHIC INFORMATION

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Education and Training

Graduate:

1980-1986 M.B. B.Ch., BAO, LRCPI, LRCSI.(Hons).

The Royal College of Surgeons in Ireland, Dublin, Ireland

1987-1988 B.Sc. in Anatomy, Embryology and Physical Anthropology (First Place)

University College, Dublin, Ireland

Postdoctoral:

1986-1987 General Internship in the Professorial Unit (6 months surgery/medicine): The
Charitable Infirmary, Jervis Street Teaching Hospital of the Royal College of
Surgeons, Dublin, Ireland

1987-1988 Lecturer in Anatomy, Department of Anatomy, The Royal College of Surgeons,
Dublin, Ireland

1987-1988 Surgical house officer St. Joseph's Hospital, Raheny, Dublin, Ireland.

- 1989 General Surgery Training Scheme, Department of Surgery, Beaumont Hospital, Dublin, Ireland.
- 1989-1990 General Medicine Internship, Albany Medical Center, Albany, New York.
- 1990-1993 Radiology Residency, Department of Radiology, Albany Medical Center, Albany, New York.
- 1993-1994 Radiology Residency, Department of Radiology, University of Michigan Medical Center, Ann Arbor, Michigan
- 1994-1996 Neuroradiology Fellowship, Division of Neuroradiology, Department of Radiology, University of Michigan Medical Center, Ann Arbor, Michigan.
- 1996-1997 Interventional Neuroradiology (Mentor: Prof. Rüfenacht) Division of Neuroradiology, Department of Radiology, Hospital Cantonal, University of Geneva, Geneva, Switzerland.

Professional Experience

- 1995-1996 Lecturer in Neuroradiology, Department of Radiology Veterans Administration Medical Center, Ann Arbor, Michigan.
- 1995-1996 Lecturer in Neuroradiology, Department of Radiology, University of Michigan Medical Center, Ann Arbor, Michigan.
- 1997-1998 Assistant Professor of Radiology, Section Chief of Neuroradiology and Director of Interventional & Therapeutic Neuroradiology, Albany Medical College, Albany, New York.
- 1997-1998 Director of Radiology Research, Albany Medical College, Albany, New York
- 1998-2000 Assistant Professor of Radiology and Neurological Surgery, Director of Interventional Neuroradiology, Division of Neuroradiology, Johns Hopkins University, School of Medicine.
- 2000-present Associate Professor of Radiology and Neurological Surgery, Director of Interventional Neuroradiology, Johns Hopkins University, School of Medicine.

RESEARCH ACTIVITIES

Publications

Peer-Reviewed Articles

1. **Murphy K.** Planting mangoes for the future in Tibet. *British Medical Journal*. 1986; 293:1649-1652.
2. **Murphy KJ, MacFarlane DJ, Shulkin BL.** FDG PET imaging of paragangliomas of the neck: Comparison with MIBG SPECT. *European Journal of Nuclear Medicine* 1995; 22(11):1347-1350.
3. **Murphy K, Brunberg JA.** Images in clinical medicine. Miliary tuberculosis in the central nervous system. *N Engl J Med* 1996; 334(12):769.
4. **Murphy KJ, Brunberg JA.** Evaluation of the history of injury as the threshold for screening orbital plain films prior to MRI. *American Journal of Roentgenology* 1996; 167:847-849.
5. **Murphy KJ, Brunberg JA, Cohan RH.** Contrast reactions associated with gadolinium chelate administration. *American Journal of Roentgenology* 1996; 167:1053-1055.

6. **Murphy KJ**, Kazerooni EA, Weinberg E, Killam D, Hendrick WJ, Braun M. The radiographic presentation of the intrathoracic complications of pregnancy *Can Assoc Radiol* . 1996 Dec; 47.
7. **Murphy KJ**. Radiology in Nepal. *American Journal of Roentgenology*. 1996; 167:1593-1594.
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9. **Murphy KJ**, Cloft HJ, Prince M. 3D gadolinium-enhanced MR angiography of the carotid arteries. *Magnetic Resonance Imaging*. 1997; 14(6):593-600.
10. **Murphy KJ**, Brunberg JA. Claustrophobia and sedation in MRI. *Magnetic Resonance Imaging*. 1997; 15(1):51-54.
11. **Murphy KJ**, Rubin JA. Power Doppler "It's a Good Thing." *Seminars in US, CT and MRI*. 1997; 18(1):13-21.
12. Hilborn M, **Murphy KJ**, Bude RO, Platt JF, Rubin JM. Renal transplant rejection evaluation with power Doppler sonography. *British Journal of Radiology*. 1997; 70:39-42.
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14. **Murphy KJ**, Bude RO, Rubin JM. Transcranial Doppler with ultrasound contrast material comparison of color and power Doppler sonography. *Academic Radiology*. 1997; 4:577-582.
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17. **Murphy KJ**, Brunberg JA, Kasanjian P. Intramedullary cord infections: myelitis and cord abscess formation. *American Journal of Neuroradiology*. 1998; 19:341-348.
18. **Murphy KJ**, Deveikis JP, Jamadar DA, Brunberg JA, Dickinson LD, Ross DA, Frey KA. [O-15] H₂O positron emission tomography determination of cerebral blood flow after intravenous acetazolamide during balloon test occlusion of the internal carotid artery. *Interventional Neuroradiology*. 1998; 4:57-62.
19. **Murphy KJ**, Beydoun A, Brunberg JA, Jamadar DA, Frey KA. Correlation of Continuous EEG Monitoring with [O-15]H₂O Positron Emission Tomography Determination of Cerebral Blood Flow during Balloon Test Occlusion of the Internal Carotid Artery . Experience in 32 cases. *Interventional Neuroradiology*. 1998; 4:51-55.
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54. Gailloud P, Hillis A, Perler B, **Murphy KJ**. Vertebrobasilar stroke as a late complication of a Blalock-Taussig shunt. *Annals Neurology*. 2002 Aug; 52(2):231-4.
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76. Subramanian PS, Gailloud PH, Heck DV, Tamargo RJ, **Murphy KJ**, Miller, NR. Guglielmi Detachable Coil Embolization of a Symptomatic, Isolated Orbital Arteriovenous Fistula via a Superior Ophthalmic Vein Approach. *Neuroradiology*. (2004, in press).
77. Nussbaum D, Gailloud P, **Murphy K**. Vertebroplasty and Kyphoplasty Complications Reported to FDA Website. *Journal of Vascular and Interventional Radiology*. (2004, in press).

Review Articles

1. Rapoport R, **Murphy KJ**. Clinical experience with a superconducting 0.35T Open MRI system. *Toshiba Medical Review*. 1999; 69.
2. **Murphy KJ**, Deramond H. Vertebroplasty in Benign and Malignant Disease, *Neuroimaging Clinics of North America*. 2000;10(3):535-545.
3. **Murphy KJ**, Fessler R. Vertebroplasty: a state of the art review. *Neurosurgery Quarterly*. 2001 Summer.
4. Li KW, Haroun RI, Clatterbuck RE, **Murphy KJ**, Rigamonti D. Superficial siderosis associated with multiple cavernous malformations: report of three cases. *Neurosurgery*. 2001 May; 48(5):1147-50 and accompanied editorial pp 1150-1. Review.
5. **Murphy KJ**. Multidetector CT and CTA: changes in patient and CTA: changes in patient management. *Toshiba Medical Review*. 2002 Jul.
6. **Murphy KJ**. Multidetector CT and CTA: changes in acute stroke. *Toshiba Medical Review*. 2002 Aug.
7. **Murphy KJ**. Multidetector Helical CT guided spine interventions. *Toshiba Medical Review*. 2002 Sep.
8. **Murphy KJ**. Multidetector Helical MDCT in the neurointensive care setting. *Toshiba Medical Review*. 2002 Oct.
9. O Bray R, **Murphy KJ**. Multidetector CTA in acute stroke. *Diagnostic Imaging*. 2002 Nov.
10. O Bray R, **Murphy KJ**. CT fluoroscopy and Neurointervention. *Diagnostic Imaging*. 2002 Dec.
11. O Bray R, **Murphy KJ**. Editorial on Epistaxis for the Interventionalist. *Interventionalist*. 2002 Fall.

Letters

1. Gailloud P, **Murphy KJ**. Rupture of cerebral aneurysm during angiography: Letter to the Editor, *New England Journal of Medicine*. 1999; 340(18):1442.
2. Tamargo RJ, Rigamonti D, **Murphy KJ**, Gailloud P, Conway JE, Clatterbuck RE. Endovascular and surgical treatment of unruptured aneurysms: comparison of risks. *Annals of Neurology*. Letter to the Editor 2001; 49:682-684.

Book Chapters

1. "Human anatomy brought to life; The Living Brain": Radiation Science. Uses in Medical Imaging and Therapy. Paul L. Carson PhD (ed.) ISBN 0-7872-0817-5, 1995. American College of Radiology, Radiology Centennial Radiation Science Project.
2. "Human anatomy brought to life; The Spine". Radiation Science. Uses in Medical Imaging and Therapy. Paul L. Carson PhD (ed.) ISBN 0-7872-0817-5, 1995. American College of Radiology, Radiology Centennial Radiation Science Project. This was a multifaceted interactive project composed of video, text, and computer programs aimed at the teaching of physics through radiology.
3. "Percutaneous diagnostic biopsy techniques for tumors of the spine and peripheral nerves" in Spinal cord and spinal column tumors principles and practice edited by Dickman, Fehlings Gokaslan published by Thieme 2003.

Inventions, Patents, Copyrights

Awarded

Aug., 2001	Method and Apparatus for Strengthening Vertebral Bodies. US 6,273,916
Sep., 2002	Co axial Biopsy Gun for obtaining tissue from a hard substance. US 6,450,973
Dec., 2002	Needle Control Device for reducing radiation exposure. US 6,488,667
July, 2003	A CSF shunt for chronic obstructive hydrocephalus, with access ports to allow in situ repair of obstructions, and telemetric pressure monitoring valve mechanism located on the chest wall. This patent represents the application of interventional neuroradiology catheter technology to ventriculo peritoneal shunt design. US 6,585,677

Patient Pending

June, 2003	Simulation System for Medical Procedures
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Extramural Sponsorships

Grants

Current

2001-2005	Co-investigator (2% effort), American Heart Association (02701755N) The inflammatory hypothesis of cerebral vasospasm, leucocytes as mediators and therapeutic targets. (Dr. R. Tamargo, Principle Investigator) \$400,000
2003	Co-investigator (5% effort), RO1 NS 42607-01A2: Induced hypertension in acute ischemic stroke, An RO1 submission to the National Institute of Neurologic Disease (NINDS) \$811,936
2003-2005	Principle Investigator (10% effort), Training Grant for Fellowship in Interventional Neuroradiology, given by American Society of Interventional Neuroradiology and American Association on Neurosurgeons (section of Cerebrovascular Disease Endovascular Surgical) \$100,000
2004-2005	Co-Investigator (1% effort), Cordis Neurovascular: A Feasibility Study of the Cordis Neurovascular Self-Expanding Stent System to Facilitate Endovascular Coil Embolization of Wide Neck Saccular Intracranial Artery Aneurysms. \$9,000

- 2004-2006 National, Principal Investigator (12% effort), **Cook, Inc.:** Vertebral Fracture Stabilization with Vertifix™ Radiopaque Bone Cement plus Radiation Therapy vs. Radiation Therapy Alone for Pain Relief in Pathologic Metastatic Vertebral Fractures.
\$100,000
- 2004-2006 Johns Hopkins Site, Principle Investigator (5% effort), **CoAxia, Inc.:** A Clinical Study of Perfusion Augmentation in Acute Ischemic Stroke Using NeuroFlo™ Technology. And A Neurological Imaging Study of Acute Ischemic Stroke Subjects Between 6-12 Hours of Symptom Onset.
\$30,000
- 2005-2008 Johns Hopkins Site Principal Investigator (5% effort), **National Institutes of Health:** R01 NS39512 Familial Intracranial Aneurysm Study.
\$161,876
- Pending*
- 2004-2006 Co-Investigator (2% effort): **American Heart Association** Beginning Grant-in-Aid. Long-term Cerebrovascular Outcome Following the Blalock-Taussig Shunt and Total Cardiac Repair.
\$125,000
- 2004-2008 International Principal Investigator (U.S. and Europe) (10% effort): Osteoporotic Spine Intervention Registry (OSIR). A multi-site registry to compare the safety and efficacy of Percutaneous Vertebroplasty and Kyphoplasty for treatment of osteoporotic fracture(s).
\$1,680,000
- 2005-2006 Principal Investigator (7% effort), **National Institutes of Health SBIR** submission 4/1/04: Ultrasound Ablation of Bone Cancer Under CT-Fluoroscopy.
\$300,000
- 2005-2007 Principal Investigator (20% effort), **National Institutes of Health R21** submission 2/1/04: Novel Therapy for ICH: Minimally Invasive Intervention.
\$275,000
- 2005-2007 Principal Investigator (15% effort), **National Institutes of Health R21** submission 2/1/04: Analysis of Color Mapped Unenhanced Head CT in Stroke.
\$275,000
- 2005-2010 Principal Investigator, (15% effort) **National Institutes of Health Quantum Project: Technology-based Advances in Healthcare** submission 1/9/04: Image Guided Therapy of Vertebral Benign and Malignant Disease.
\$1,250,000
- 2005-2010 Principal Investigator, (15% effort) **National Institutes of Health Quantum Project: Technology-based Advances in Healthcare** submission 1/9/04: Acute Intervention Centers - a modular franchise concept for the collaborative multidisciplinary treatment of acute MI and acute Stroke.
\$1,250,000
- Previous*
- 1996-1997 Co-Investigator, **FDA Protocol 204-07 Phase 3 Levovist study.** A phase 3 study of the safety, subject acceptance, and efficacy of Levovist injection (a Galactose

based microbubble preparation) in subjects with inconclusive arterial Doppler Sonographic examination and use in transcranial ultrasound.

\$15,000

1997-2001 Medical Project Leader of the **European Phase 2 Multicenter Trial** of the new Cook Detach-18 detachable platinum coil. This coil is designed for neuroradiological embolizations in the arterial and venous circulations. The study was carried out at 8 major European Neurointerventional centers, including the University of Geneva, Hopital Lariboisiere Paris, the University of Wurtzburg, Hospital General De Cataluna, Barcelóna, and The Radcliffe Infirmary, Oxford. Based on this study, FDA approval and CE marking was obtained.

Clinical Funding: **\$5,000,000**

1998-2001 Co-Investigator, **National Science Foundation**: PR 97M508 Anti-CD 18 monoclonal antibody for the treatment of vasospasm caused by subarachnoid hemorrhage in primates. (Dr. R. Tamargo, Principal Investigator)

\$300,000

2001-2003 Co-Investigator, **National Institutes of Health**, Shared Instrumentation Grant: IS10RR015721-01 Cardiovascular Animal Research X-Ray Imaging System.

\$500,000

Contracts

2000-present Principle Investigator (20% effort), Center for Image Guided Therapy Center (CIGT). Establishment of the CIGT as a place for collegial interactions of all image-guided therapists, to encourage cross-fertilization of ideas and techniques, and collaboration for research and educational activities.

- Two 16-slice multidetector CT scanners (Bayview, Nelson B-100, Johns Hopkins Hospital)
- One 4-slice multidetector CT scanner adjacent to the Meyer Neurointensive Care Unit, (Johns Hopkins Hospital)
- One biplane neuroradiology angiography suite (Nelson B-100, Johns Hopkins Hospital)
- Two single plane angiography suites (CIGT Traylor 3, Johns Hopkins University School of Medicine)

Direct research support: **\$ 360,000**

Capital Equipment support: **\$8,000,000**

There are areas of ongoing research in collaboration with Toshiba which include but are not limited to:

1. Research and development of a flat panel detector for angiography imaging.
2. Research and development of CT fluoroscopy in interventional neuroradiology, intracranial direct puncture interventions, radiofrequency ablation and intracranial navigation.
3. Six sigma work flow analysis of radiology and the implications in machine and software design for radiology and cardiology.

4. Process improvement in radiology and cardiology, and analysis of the benefit of MDCT in the ER in acute coronary syndrome and acute stroke, as evidenced by decrease in hospital stay.
5. Creation of an international users group based in Berlin, Germany, Leiden, Holland, Fujita, Japan and Baltimore, MD. We will all have the same equipment simultaneously, and collaborate via secure web servers and biannual meetings. This group will focus on Multidetector CT development for the investigation of acute stroke and acute coronary syndromes.
6. Establishment of the CIGT as a place for collegial interactions of all image-guided therapists, to encourage cross-fertilization of ideas and techniques, and collaboration for research and educational activities.

IRB Approved Studies

2000	Detach-18 coil for endovascular intracranial vascular embolization. IRB approval was terminated when FDA approval was obtained for the device.
1998-2001	Vertebroplasty- The augmentation of fractured vertebral bodies with orthopedic bone cement in benign and malignant disease. We discontinued the IRB approval as this procedure has now become the standard of care nationally
1999-2001	ISAT, the International Subarachnoid Aneurysm Trial, in which patients with subarachnoid hemorrhage are randomized to endovascular coiling versus open surgical clipping. Drs Rigamonti and Tamargo were co-investigators. There were 44 centers in Europe and Canada, with over 2,134 patients were enrolled. Enrollment has been stopped and patient follow up is now ongoing for 5 years. The first report has been published in the Lancet (2002 ;360:1267-74.)
2004	Boston Scientific Humanitarian Use Device: Neuroform™ Microdelivery Stent. IRB approval for HDE.

EDUCATIONAL ACTIVITIES

Teaching

University of Michigan:

1995	Neurology Grand Rounds "The Neuroradiology of the HIV positive patient."
1995-1996	MRI Physics Lecturer to M3 Students as part of the radiology Curriculum
1995-1996	Coordinator, Neuroradiology- teaching case conference each Tuesday morning for radiology residents

Johns Hopkins University School of Medicine:

1999-present	Weekly Neurovascular Conference A multidisciplinary discussion of neurovascular cases, with consensus based treatment attended by Neurology, Neurosurgery, and Interventional Neuroradiology and neurointensive care. This is 1 hour of CME credit per week.
1999	Radiology Grand Rounds: "Interventional Neuroradiology: Team solutions to clinical problems."
2000	The Conjoint Rounds Conference Hurd Hall "Vertebroplasty in Benign and Malignant Disease."

- 2001 Radiology Grand Rounds "A multidisciplinary approach to Interventional Neuroradiology."
- 2001 CVDL Fellow Lecture Series "Vertebroplasty and Carotid Stenting"
- 2001 Neuroradiology Fellow Lecture Series "Carotid Stenting."
- 2001 Neurosurgical Grand Rounds "A multidisciplinary approach to Interventional Neuroradiology"
- 2001 Johns Hopkins Neuroradiology Review Course "Spine interventions."
- 2001 Howard County Hospital Grand Rounds "A multidisciplinary approach to Interventional Neuroradiology."
- 2002 Radiology Grand Rounds "Multidetector CT in Interventional Neuroradiology"
- 2002 Johns Hopkins Neuroradiology Review Course "Management of intracranial Aneurysms."
- 2002 CVDL Fellow Lecture Series topic "Vertebroplasty."
- 2002 CVDL Fellow lecture series topic "Carotid stenting."
- 2002 Radiology Resident Research Initiative "The intellectual joy of clinical research."
- 2003 Town Hall Meeting "Research Report: Drug and Stent Therapy for Arterial Blockage — A Newsweek 'Top Ten Innovation' for 2003."

International and National CME Accredited Conferences:

- 1998 1st North American Vertebroplasty Conference, Sundance Resort, Utah
Course Director
- 1999 2nd North American Vertebroplasty Conference, Sundance Resort, Utah
Course Director
- 1999-2000 "Hands on Vertebroplasty" Training Course by JHMI and the University of Maryland (4 courses in 1999, 1 in 2000)
- 1999 "Hands on Vertebroplasty" Training Course by Tampa General Hospital, the University of Virginia, and Emory University (3 courses in 1999, 2 in 2000)
- 2000 The Johns Hopkins International Vertebroplasty Conference, Mont Tremblant, Canada
Course Director
- 2000 The Johns Hopkins International Carotid Stenting Conference at Mont Tremblant Canada
Course Director
This was the first international meeting on carotid stenting and cerebral revascularization with hands on training and teaching by international faculty.
- 2000 "Hands on Vertebroplasty training course" at the Annual Society of Cardiovascular Interventional Radiologists (SCVIR) meeting San Diego, CA.
Teaching Faculty
- 2001 "Hands on Vertebroplasty training course" at the Annual Society of Cardiovascular Interventional Radiologists SCVIR meeting San Antonio, TX.
Teaching Faculty
- 2001 Workshop on "Carotid Stent and Cerebral Revascularization" Hands on Workshops, American Society of Neuroradiology (ASNR) Meeting, Boston, MA.
Course Director

- 2000 “Carotid Stent and Cerebral revascularization” Hands on Workshops, Annual Society of Cardiovascular Interventional Radiologists (SCVIR) meeting, Baltimore, MD
Course Director
- 2001 “Cerebrovascular Emergencies”. Johns Hopkins Medicine, Baltimore, MD
Course Director
- 2002-present Center for Image Guided Therapy Training (CIGT) at Johns Hopkins University, School of Medicine.
Course Director
A two-day hands on training courses for 6 attendees on Vertebroplasty. (6 courses in 2002, 9 courses in 2003 and 6 courses in 2004)
- 2002-2003 “Stroke Thrombolysis and Carotid Stent” training course jointly run through the Society of Interventional radiology (SIR) American and the Society of Interventional Therapeutic Neuroradiology (ASITN).
The aim of this course is to teach large numbers of radiologists in the skills needed to treat acute stroke. This course will be conducted in both the Dotter Institute, Oregon Hospital State University (OHSU) Portland, OR and the Center for Image guided Therapy (CIGT), Johns Hopkins University School of Medicine, Baltimore, MD.
Course Director (5 courses in 2002, 2 courses in 2003)
- 2003 “Carotid Stent and Cerebral Revascularization” and “Vertebroplasty” Hands on Workshops, Annual Society of Cardiovascular Interventional Radiologists (SCVIR) Meeting, Salt Lake City, UT.
Course Director
- 2004 “The Equinox Seminar. Stenting Coiling and Catheters: Evolution or Natural Selection? Sharing Knowledge.” The aim of this course is to discuss issues related to image-guided therapy with cardiologists, vascular surgeons, neurosurgeons and radiologists to build negotiation skills and dialogue.
Course Director

Mentoring

Neurointerventional Fellowship Training

- 1998 Phillipe Gailloud, M.D.
Current position: Interventional Neuroradiologist, Assistant Professor of Radiology, Johns Hopkins University
- 2001 Donald Heck, M.D.
Current Position, Interventional Neuroradiologist, Salem, NC.
- 2002 Jeffery Carpenter, M.D.
Current Position: Interventional Neuroradiologist. Director of Neuroradiology, University of West Virginia, Morgantown, WV.
- 2003 Baljit Deol, M.D.
Future Position: Interventional Neuroradiologist, position pending.
- 2003 Jacob Agris, M.D.
Future Position: Director of Interventional Neuroradiology, Richmond, VA.

Editorial Activities

Journal Peer Reviewer

1999-present Reviewer, American Journal of Neuroradiology
2000-present Reviewer, Radiographics
2001-present Reviewer, Annals of Neurology
2000-present Reviewer, Radiology
2002-present Reviewer, Ultrasound in Obstetrics and Gynecology

Scientific Meeting Reviewer

1998-present Radiology Society of North America for RadioGraphics

CLINICAL ACTIVITIES

1998-present Director of Interventional Neuroradiology, Johns Hopkins University
We perform approximately 2,500 exams per year. We perform 7-10 Interventional Neuroradiology cases and 30 diagnostic cerebral angiograms per week.
Interventions include spine, vertebroplasty, and intraoperative angiography. We have increased the number of procedures by 300% over the past 4 years. We have 9 dedicated interventional neuroradiology X-ray technologists and 4 nurses.

Specialty Certifications

Medical License

Maryland: D0054096

Michigan: expired

New York: expired

Certifications

1994 Board Certification in Radiology

1994 Fellow of the Royal College of Physicians of Canada, June 1994 (FRCPC)

1997 Certificate of added qualification (CAQ) in Neuroradiology

Organizational Activities

Intradepartmental Committees and Administrative Service

2001 Committee member for the interventional and therapeutic component of the Department of radiology

2002 Member of Oversight Committee for the Center for Image Guided Therapy (CIGT)

2002 **Iceland:** I have worked for 18 months to develop a relationship with the Icelandic government, to transfer neurovascular patients to JHH for treatment. I visited Iceland on December 19-20, with a member of the international office for 2 days of negotiation and to deliver CME educational lectures on neurovascular topics. This will benefit all the neuroscience group. These patients will be transferred to JHH.

2003 **Johns Hopkins Bayview Medical Center:** Our service expanded to Bayview in November, 2003 and supply 1/5 of an FTE there as well as continue preexisting call coverage.

- 2003 **GBMC** Over the past year I have developed excellent relationships with GBMC physicians. We began our interventional oncology service there on March 17th. They will pay us \$200,000 per year for one day a week service. All other patients will be transferred to JHH.
- 2003 **Future: Penn State Medical Center at Hershey** Over the past 2 year I have developed excellent relationships with Penn state physicians. In late 2002 we will begin a service there. They will pay us \$175,000 per year for one day a week service. All other patients will be transferred to JHH.

Interdepartmental Committees

- 1997-1998 Chairman of MRI Process Improvement, Department of Radiology, Albany Medical Center, Albany, New York
- 2000 Member of the Vasculitis Group. Johns Hopkins Medicine.
- 2000-present Multidisciplinary center of excellence for ischemic brain injury and neurovascular disease, working group member Johns Hopkins Medicine.
- 2000-present Hydrocephalus Working Group member, we aim to develop a center of excellence for management of normal pressure hydrocephalus of dementia with Dr. Michael Williams, Dept. Neurology, and Dr. Daniele Rigamonti, Dept. Neurosurgery.
- 2001 Neurovascular center marketing effort Coordination with Dr. Eric Aldrich of the effort which involves Neurosurgery/neurology/NCCU and INR
- 2003 The Johns Hopkins Heart and Vascular Institute Organization group. Member of the Integration of services (building and planning), and Fund raising/Development group.
- 2003-present Member of Committee to establish the Center for Cerebrovascular Disease and obtain designation as a Primary Comprehensive Stroke Center by JCAHO and the state.

Professional Societies

Memberships

- 1988 Medical Director, CHI, Community Health International (a Irish based non-government aid organization)
- 1991– present Radiological Society of North America (RSNA)
- 1991– present American Roentgen Ray Society (ARRS)
- 1994– 1997 Junior Member: American Society of Neuroradiology (ASNR)
- 1997– present Senior Member American Society of Neuroradiology (ASNR)
- 1997– present American Society of Interventional & Therapeutic Neuroradiology (ASITN)
- 1998-present Society of Cardiovascular and Interventional Neuroradiology (SCVIR).
- 2000–present The American Society of Spine Radiologists (ASSR)
- 2000–present Council member, The American Heart Association Council on Stroke

Offices and Positions

- 1994-1995 American College of Radiology Centennial School Education Committee Member

- 2002 SCVIR Advisory Panel Member to the FDA on Stroke and Cerebral Revascularization.
- 2002 Guest Speaker on Capitol Hill on behalf of The American Heart Association, American Society of Interventional Therapeutic Neuroradiology and the American Society of Neuroradiology in support of the STOP legislation. If this legislation is passed, 450 Million dollars will be made available for patient education on stroke.
- 2002 Invited speaker to the FDA in-house educational symposium on vertebroplasty and cerebral revascularization
- 2002 Invited speaker to the FDA symposium on anticoagulation, antiplatelets, and thrombolytic therapies.
- 2002-2003 Course Director of the Society of Interventional Radiology (SIR) and American Society of Interventional Therapeutic (ASITN) Radiology Training Programs on cerebral revascularization and carotid stenting.
- 2003-2004 Course Director of the Society of Interventional Radiology (SIR) and American Society of Interventional Therapeutic (ASITN) Radiology Training Programs on cerebral revascularization and carotid stenting.

RECOGNITION

Undergraduate Honors and Awards

- 1984 Gold Medal in Medicine and Surgery, Royal College of Surgeons, Dublin, Ireland
- 1985 Honors in Psychiatry, Obstetrics, Gynecology, ENT and Ophthalmology.
- 1986 J. J. Fitzsimmons Gold Medal for Internal Medicine Royal College of Surgeons, Dublin, Ireland
- 1986 Gold Medal in Surgery, Royal College of Surgeons, Dublin, Ireland.
- 1986 Gold Medal in Medicine James Connolly Memorial Hospital.
- 1986 Gold Medal and McDonnell Prize in Surgery, The Charitable Infirmary, Dublin, Ireland.

Postgraduate Honors and Awards

- 1988 Joint 1st Place, B.Sc. in Anatomy, Embryology and Physical Anthropology, University College, Dublin, Ireland
- 1996 Roentgen Fellow Outstanding Research Award, Radiological Society of North America (RSNA).
- 1998 Prix du jubilé - Société Suisse de Radiologie Médicale, Modeles in vitro de fistules artérioveineuses intracrâniennes pour l'évaluation de nouveaux matériaux de traitement endovasculaire. Gailloud P, Muster M, **Murphy, KJ**, Mottu F, Piotin M, Mandai S, Fasel JHD, Rüfenach, DA.

Invited Talks

National

1. MR Angiography at Low Field/Open MR. Key speaker at the Open MRI Conference, Hilton Head, August 28, 1998.

2. "The Future of Low Field MR." Key speaker at the Open MRI Conference, Hilton Head, August 28, 1998.
3. "Vertebroplasty" Key Speaker at the Northeastern Vascular Interventional Radiologist Technologist Annual Meeting, Buffalo, NY, October 16, 1998.
4. "Vertebroplasty" Key Speaker at the Mid America Interventional Radiology Society Annual Meeting, Kansas City, April 10, 1999.
5. "Extracranial Embolization" Key Speaker at The Mid-America Interventional Radiology Society Annual Meeting, Kansas City, April 10, 1999.
6. "Managing a Gadolinium Contrast Reaction" Key Speaker at the Open MRI Conference, Las Vegas, March 31, 1999.
7. "Dealing with a Gadolinium Contrast Reaction" Key Speaker at the Open MRI Conference, Las Vegas, March 31, 1999.
8. "The Future of Open MR Imaging" Key Speaker at the Open MRI Conference, Las Vegas, March 31, 1999.
9. "Neurointervention" Speaker at the Sixth Annual University of Pennsylvania Conference on Interventional Radiology, Wye River, May 23, 1999.
10. Hopkins on the Road Lectures at Montgomery General Hospital, "Interventional Neuroradiology", 1999
11. "Vertebroplasty in benign and malignant disease". Chesapeake Bay Radiological Society, Speaker. August 26, 1999.
12. Neuroradiology Review Course, The Johns Hopkins University School of Medicine, Speaker, Baltimore, September 30, 1999.
13. Mid American Interventional Radiology Society Meeting, Springfield, October 19, 1999.
14. Hopkins On The Road Lecture, "Acute Stroke Management as a Multidisciplinary Team" at Frederick Memorial Hospital, Frederick, MD, November 12, 1999.
15. Hopkins On The Road Lecture, "Acute Stroke Management as a Multidisciplinary Team" at Doctors Community Hospital, Lanham, MD, December 2, 1999.
16. Hopkins On The Road Lecture, "Endovascular Treatment of Intracranial Neurovascular Disease" Harbor Hospital, Baltimore, December 3, 1999.
17. American Association of Neurosurgeons (AANS) Annual Meeting, "Cavernous Malformation" Key Speaker, February 2000.
18. "Vertebroplasty in the relief of severe pain after osteoporotic fracture". Johns Hopkins Pain Anesthesia Conference, Baltimore MD 8/25-26/2000.
19. Vertebroplasty in Benign and Malignant Disease. The American Association of Interventional Radiology Technologists Meeting, Rochester, NY, September, 2000.
20. Howard County Hospital Grand Rounds, November, 2001
21. "Carotid Stenting" St Agnes Hospital Cardiovascular Research Day Guest Speaker, Nov 2001
22. Guest speaker, "Multidetector CT in Neurointervention" The Stanford Multidetector CT Conference, San Francisco, June 2001.
23. Guest speaker "Carotid stenting, does it approach endarterectomy in patient benefit" The Stanford Current Updates in Interventional Radiology Meeting, Tahoe CA Feb 15th 2002.
24. Guest Speaker SVCIR 2002 "Embolization of epistaxis" April 2002
25. Guest speaker "Multidetector CT in neurointervention" The Stanford. Multidetector CT Meeting, San Francisco, June 21st 2002

26. Guest speaker "Stroke intervention and cerebral revascularization" The Stanford Current Updates in Interventional Radiology Meeting, Tahoe CA Feb 15th 2003.
27. Guest speaker "CT perfusion and acute stroke imaging" The Stanford Current Updates in Multidetector CT Meeting, San Francisco June 2003.

International

1. **Murphy KJ**, Wu VW, Miller M, Burke MJ. "Computer assisted instruction in computerized tomography of the abdomen and pelvis in the emergency room patient". Japanese Radiological Society Meeting, April 1993.
2. **Murphy KJ**, Line, BR, Malfetano, J. "Etidronate Disodium decreases the sensitivity of Tc-99m bone scanning" Society of Nuclear Medicine 40th Annual Meeting, Toronto, June 1993.
3. **Murphy KJ**, Wu VW, Miller M, Burke MJ. "Computer assisted instruction in computerized tomography of the abdomen and pelvis in the emergency room patient". Societe Francais de Radiologie et D'imagerie Medicale Paris, November 1994.
4. **Murphy KJ**. "Computer assisted instruction in computerized tomography of the emergency room patient". European Congress of Radiology, Vienna, March 1995.
5. **Murphy KJ**. MR Angiography "Its A Good Thing" Neurosciences Meeting at Beaumont Hospital, The Royal College of Surgeons in Ireland. June 1996.
6. **Murphy KJ**. "Primary Health Care for Refugees and the Role of the Graduate Physician" The Royal College of Surgeons in Ireland, June 1996.
7. **Murphy KJ**, Mandai S, Gailloud P, Muster M, Fasel JH, Rüfenacht DA. "In vitro evaluation of the behavior of new J-shaped mechanical detachable coils in a model of a dural arteriovenous fistula of the transverse sinus". Val D Isere France, The WIN International Interventional Neuroradiology Meeting, January 1997.
8. **Murphy KJ**, Mandai S, Gailloud P, Muster M, Fasel JH, Rüfenacht DA. "In-vitro studies to define the term "dense packing" of aneurysms with detachable platinum coils". Val D'Isère France, The WIN Interventional Neuroradiology meeting, January 1997.
9. "Management of severe vasospasm in patient with an untreated MCA aneurysm". Val D'Isère France, The WIN Interventional Neuroradiology meeting January 1997.
10. "Management of active subarachnoid bleeding on diagnostic angiography with GDC coiling". Val D'Isère France, The WIN International Interventional Neuroradiology meeting, January 1997.
11. Guest Speaker "Flow assisted microcatheter manipulation in interventional neuroradiology". University of Fribourg Germany, June 13, 1997.
12. Guest speaker "The role of vertebroplasty in the management of osteoporosis". The American Society of Bone and Mineral Research, Toronto, September 22, 2000.
13. Key Speaker on "Vertebroplasty" Japanese Society of Interventional Neuroradiology, May 18, 2001
14. Key Speaker at the Indian Society of Interventional Neuroradiology Trivandrum, India, February 20-25, 2001
15. Guest Speaker, "Vertebroplasty in benign and malignant disease". The Royal Australian and New Zealand College of Radiology 52nd Annual Meeting Melbourne, Australia, October, 2001

16. Guest Speaker, The Japanese Congress of Radiology Meeting Fujita, Japan, November, 2001
17. Guest speaker, "Vertebroplasty in benign and malignant disease," "Carotid stenting, how does it compete with the gold standard". The Sobrice Meeting, Rio De Janeiro, Brazil Nov, 2001
18. Guest speaker, The Munich Multidetector CT meeting April 18-19,2002
19. Session speaker, "Multidetector CT in neurointervention" American Society of Neuroradiology 2002 Vancouver, Canada
20. Guest Speaker, "Multidetector CT in neurointervention" The Royal Australian and New Zealand College of Radiology 53rd annual meeting Adelaide, Australia October, 2002
21. Guest Speaker, Dural AV Fistulas, new management options" The Italian Society of Neuroradiology May 16, 2003
22. Guest Speaker, "Vertebroplasty in benign and malignant disease" The Italian Society of Neuroradiology, Verona, Italy, May 16, 2003.

Visiting Professorships

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| 1999 | Visiting Professor New Delhi teaching vertebroplasty and endovascular techniques. February |
| 2000 | Visiting Professor at University of Toronto, and McMaster University, Ontario, Canada January 10-12 |
| 2000 | Visiting Professor Seoul South Korea, September 24-29 |
| 2000 | Visiting Professor New Delhi, and Bombay, India, Teaching Vertebroplasty, and endovascular technique, February. |
| 2001 | Visiting Professor Beijing Neurologic Institute, Ghuanghou, Harbin, Shanghai, and Hong Kong, China, January 3-12. |
| 2001 | Visiting Professor Madras Medical College, Madras India, and Vellore Medical College, February 20-25. |
| 2002 | Visiting Professor in Melbourne, Adelaide, and Sydney October |
| 2002 | Visiting Professor McMaster University, Hamilton Ontario, Canada, March 11-15. |
| 2002 | Visiting Professor Vancouver General Hospital, May. |
| 2002 | Visiting Professor Royal Perth Hospital, Perth, Australia, October. |
| 2003 | Visiting Professor Beijing Neurologic Institute, China, March 9-12. |

Voluntary International Medical and Educational Activity

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| 1983 | Ladakh, Northern India worked and educated "bare foot" doctors in a Tibetan Refugee Camp. |
| 1985 | Started a Primary Health Care Project and educated "bare foot" doctors in Ganden Monastery, in a Tibetan Refugee camp in Southern India. |
| 1986 | One month in Peru doing primary health care, educating "bare foot" doctors, working in prisons. |
| 1988 | Started a primary school for Tibetan refugees in Bodhanath, Kathmandu, Nepal. |
| 1996 | Returned to Kathmandu to support the school and for primary health care education. Visiting professor at Tribhuvan University Hospital Kathmandu. |
| 1997-present | Continued financial support of the primary school and the primary health care center. |

Alternative Media

1. Developed website for patients with access to information on stroke and vertebroplasty www.brainavm.net and www.vertbralfracture.org
2. Afternoon Drive, "Johns Hopkins Medical Minute on detachable coils for aneurysms" December 8, 1998, Tuesday, PM (ET), WBBR-AM Radio
3. News 4 This Morning, " Bone Cement" November 12, 1998, Thursday, 6:00 A.M., WFOR-TV, Television
4. News Four This Morning," Doctors at Johns Hopkins Medical Center in Baltimore are using glue to fix fractures in the spine" November 12, 1998, Thursday, AM (MT), KCNC-TV, Television
5. Eyewitness News, " New glue which cements bone together" November 12, 1998, Thursday, AM, KPIX-TV, Television
6. Channel Two News at Noon, " There is a new superglue that fixes fractures" November 12, 1998, Thursday, 12:00 PM, WCBS-TV, Television
7. Eyewitness News Update, November 11, 1998, Wednesday, 11:00 PM, KDKA-TV, Television
8. News 3, November 11, 1998, Wednesday, PM, KYW-TV, Television
9. CBS 2 News at Eleven, November 11, 1998, Wednesday, 11:00 PM (PT), KCBS-TV, Television
10. Eyewitness News, November 11, 1998, Wednesday, PM, WJZ-TV, Television
11. Biotech Week, August 8, 2001, EXPANDED REPORTING; Pg. 24, 390 words, TOSHIBA CORP. MEDICAL SYSTEMS CO.; Joint Research Program, Training Center, For Interventional Radiology Formed
12. Pain & Central Nervous System, Week, April 29, 2002, EDITOR'S CHOICE; Pg. 9, 491 words, SURGERY: Cognitive testing reduces risks of procedure for brain arteriovenous malformations.
13. Medical Devices & Surgical Technology Week, December 1, 2002, EDITOR'S CHOICE; Pg 2, 506 words, ANEURYSM: Brain coils slash death, disability
14. Pain & Central Nervous System Week, November 25, 2002, EDITOR'S CHOICE; Pg. 5, 505 words, ANEURYSM: Brain coils slash death disability.
15. Internet Wire, October 29, 2002 Tuesday, 561 words, Reducing The Risk of Death and Disability from Ruptured Brain Aneurysms; New Study Sheds Light on Coiling Treatment, October 29, 2002, Englewood, Co; Internet Wire.
16. UNITED PRESS INTERNATIONAL, JUNE 10, 2002, Monday, ENTERTAINMENT, 708 words, Health Tips, by Lida Wasowicz, UPI Senior Science Writer.
17. The Baltimore Sun, December 9, 2002 Monday, FINAL Edition, Pg. 1A, 1824 words, Promising Stroke Therapy may be held up in debates; Drugs dissolves clots; some worry it's too risky, Diana K. Sugg.
18. Newsday (New York, NY), October 26m 2002 Saturday, ALL EDITIONS, Pg. A19, 373 words, Method to Treat Aneurysms, by Jamie Talan, (staff writer).
19. The Baltimore Sun, October 25, 2002, Friday, FINAL edition, Pg. 3, 727 words, Progress in Aneurysm Treatment; Inserting platinum coils often more effective than using clips, study shows, Jonathan Bor.

20. The New York Times, November 12, 2002, Tuesday, Late Edition – Final, Section F; Page 5; Column 2; Health & Fitness, 1579 words, “Fixing Aneurysms without Surgery,” by Donald G. Mcneil, Jr.
21. Newsweek, December 8, 2003, Page 86, “To Save the Stricken Brain, ” part of the “Health 2003: The Top Ten” section beginning on Page 61 by Andrew Murr.